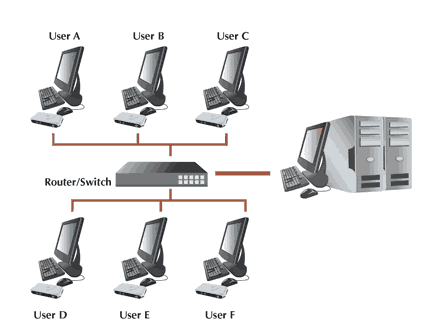
**Name: Michael Dunstan**

**Task 2 - Theory Assessment**

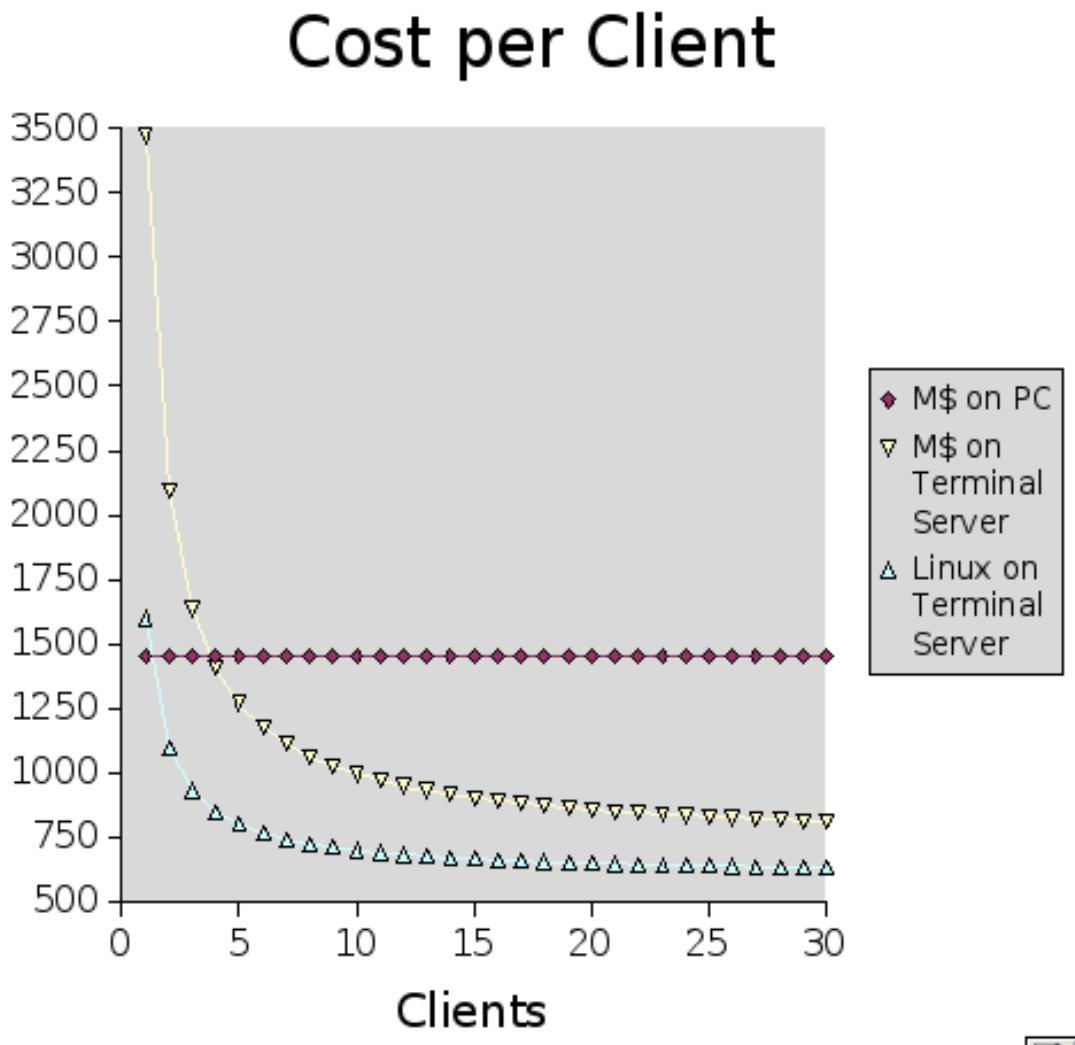
**Research and identify suitable technology solutions applicable to the project**

**Gather power consumption data on ICT equipment required for an energy audit based on an agreed standard**

**Thin Client Networks**



<http://www.ikon.is/ikon/content/view/114/52/lang,english/>



**Thin Client**

<http://en.wikipedia.org/wiki/Thin_client>

<http://www.lamarheller.com/technology/thinclient/powerstudy.pdf>

<http://net.educause.edu/ir/library/pdf/DEC0005.pdf>

A thin client (sometimes also called a lean or slim client) is a computer or a computer program which depends heavily on some other computer (its server) to fulfill its traditional computational roles. This stands in contrast to the traditional fat client, a computer designed to take on these roles by itself. The exact roles assumed by the server may vary, from providing data persistence (for example, for diskless nodes) to actual information processing on the client's behalf.

Thin clients occur as components of a broader computer infrastructure, where many clients share their computations with the same server. As such, thin client infrastructures can be viewed as the providing of some computing service via several user-interfaces.

Thin-client computing is also a way of easily maintaining computational services at a reduced total cost of ownership.

Name: Michael Dunstan

**Theory (50Marks)**

Complete the following:

Questions (5 marks each)

1. Give an overview of thin client computing to your client.

ANSWER: Thin client is a solution for users on the network who only need minimal computing power. It allows an organization to save money & reduce Carbon Emissions & Increase sustainability. They are cheaper than a standard desktop PC & also use a lot less energy than your standard PC.

1. Explain the advantages of a thin client.

ANSWER: Saving money on hardware costs. Saving money on power used & the chance to give your organization a better sustainability rating.

1. Explain the disadvantages of thin client.

ANSWER: Some applications require more computing power & cannot be run on a thin client. If the server has a problem then clients cannot operate properly.

1. Explain alternative ways to setup thin client networks in GNU/Linux

ANSWER:

* 1. Diskless Remote Boot in Linux (DRBL)

A less known alternative to LTSP is Diskless Remote Boot in Linux (DRBL) from the NCHC Free Software Labs in Taiwan. DRBL is free software and can be installed on almost any distribution of GNU/Linux, including Debian, Ubuntu, Mandriva, Red Hat, Fedora, CentOS and SuSE. Many consider DRBL to be better than LTSP because it allows for distributed hardware resources between the server and the clients. In other words, DRBL can share the RAM between the server and the clients and utilize the client's harddrive for server swap space. Moreover, DRBL is able to fully detect the local hardware of the clients, so it doesn't require complicated fiddling to use local drives like LTSP.

* 1. 2X TerminalServer

2X TerminalServer is an attractive alternative to LTSP and DRBL for people who want more polished software with a nice graphical administration tools and a user-friendly setup. Like LTSP and DRBL, 2X TerminalServer is free software for creating GNU/Linux networks with X-Windows thin clients, but it offers graphical management tools to administer the terminal server remotely from any web browser. By default 2X TerminalServer uses the NX protocol, which compresses and encrypts standard X-Windows video so it can reduce the network load and create Wide Area Networks (WANs) which function over phone lines and low-bandwidth connections. NX compression can also be enabled in DRBS and LTSP, but it isn't included by default and is more difficult to implement.

* 1. Thinstation

Thinstation is a free software project based upon the now-defunct netstation project, which creates diskless clients in almost any type of thin client network. Like LTSP and DRBL, Thinstation transfers a basic GNU/Linux operating system over the network and loads it into the RAM of the clients. LTSP and DRBL, however, include a terminal server, whereas Thinstation simply displays terminals from almost any type of terminal server. It can handle Microsoft's RDP, Citrix's ICA, X (X-Windows protocol), NX (compressed X-Windows protocol), 2X ThinClient, Cendio ThinLinc, Tarantella, VNC, telnet, tn5250, VMS term, and SSH protocols. Thinstation's flexibility allows diskless thin clients to be setup in almost any kind of network.

* 1. VNC

Sometimes it is necessary to access another computer on the network. There are a number of options for creating this type of hybrid client which can use the local operating system, but can also access the resources of another computer. Many network administrators who want to remotely control another computer install a graphical desktop sharing program such as VNC (Virtual Network Computing) or tightVNC. This program transmits the keyboard and mouse events from a remote computer to a host computer, then relays screen updates back over the network. VNC runs on almost all platforms including Windows, UNIX and Mac, and is very useful when trying to connect to another type of computer. For instance, many network administrators on Windows machines, use VNC to remotely control a GNU/Linux server.

* 1. rdesktop

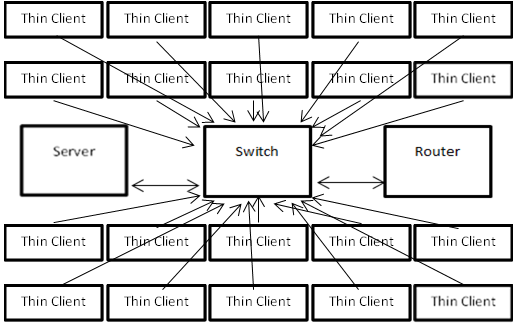
rdesktop, which stands for “remote desktop”, displays Microsoft's RDP protocol on a UNIX or GNU/Linux machine. rdesktop allows GNU/Linux clients to use the Terminal Services from a machine running Windows Server NT 4.0/2000/2003. rdesktop is extremely useful in mixed networks where GNU/Linux and Windows clients have to share a network. Some network administrators who want to save on licensing costs also use rdesktop on GNU/Linux clients, so that they can use buy expensive Microsoft Windows operating system licenses for each client. As an added benefit, they don't have to worry as much about managing the clients, since GNU/Linux machines rarely acquire virus, spyware, and malware. They rarely become misconfigured and users can't install unwanted software as easily as on a Windows client. Typically rdesktop is used in clients which have a local operating system installed on their harddrive, but rdesktop it can also be used with diskless clients. Thinstation and 2X have incorporated rdesktop into their software, and rdesktop can be run on a thin client network with LTSP or DRBL.

1. Recommend a Linux thin client solution for a small school classroom of 16 seats (clients)

ANSWER: A class of 16 seats an affordable, A Linux server will run all the software and each of the thin clients will be connected via Ethernet to a 24 port switch. With each thin client costing $429 and a server worth approx. $1200 means that with free software and a 24 port PoE switch at around $430 than the entire package can be put together for about $8500. This does not cover the cabling costs as you will require some fixed point data ports to be installed in the room as required.

1. Sketch your solution

ANSWER:



1. Detail hardware:

ANSWER:

|  |  |  |
| --- | --- | --- |
| Item | Cost | URL |
| Thin client | $429 x 16 = $6864 | http://www.itpro.co.uk/640534/hp-t410-all-in-one-thin-client-review-first-look |
| Switch | $430 | http://www.warcom.com.au/products/24607\_cisco\_sf\_200-24p\_24-port\_10100\_poe\_slm224pt-au?PHPSESSID=8a1fdcebb8f306b709b4c03fcd34ddca |
| Server | $1211 | http://www.ebay.com.au/itm/DELL-PowerEdge-T310-SERVER-8GB-RAM-3TB-3x1TB-RAID-2-4GHz-Xeon-Quad-X3430-NEW-/110928686679?pt=COMP\_EN\_Servers&hash=item19d3dd6e57 |
| **TOTAL COST** | $8505 |  |

1. Detail software:

ANSWER:

|  |  |  |
| --- | --- | --- |
| Item | Cost | URL |
| Open Office | $0 | www.openoffice.org |
| Edubuntu (Package) | $0 | www.edubuntu.org |
| **TOTAL COST** | $0 |  |

1. What is the expected performance of your solution?

ANSWER:

Client boot time: 2 minutes

Office apps installed: Draw, Impress, Spreadsheet & Writer.

Operational Issues: Network runs at 100Mb while using PoE.

1. Explain the sustainability merits of thin client architectures

ANSWER

Features:

The low power usage & ongoing costs are about 9 times cheaper than a desktop PC. The HP 410 does not require a power point as the power is supplied via POE and being an all in one unit with an 18.5 inch screen.

Advantages:

All in one unit with an 18.5 inch screen. The power consumption is only 13 watts, including the screen also the unit supports Power over Ethernet.

Disadvantages:

If POE is implemented then only 100Mb Ethernet is available to the thin clients.

**Practicum (50Marks)**

* **Identify power consumption of a thin client system under different operating conditions using the Current Cost EnviR Energy Monitor and appropriate power lead or similar energy meter.**
* **Recommendations on upgrading computer system.**

1. Record power consumption and notes e.g. range, variability, operating conditions:

|  |  |  |
| --- | --- | --- |
| **Condition** | **Server power consumption**  **(watts)** | **Thin Client**  **consumption**  **(watts)**  **Model:** |
| **OFF** | 3.1 | 0.27 |
| **MAX BOOT** | 3O | 5.1 |
| **IDLE** | 22 | 3.4 |
| **Word-processing** | 24 | 5.1 |
| **Spreadsheets** | 24 | 5.1 |
| **Web browsing**  <http://news.bbc.co.uk/2/hi/programmes/click_online/default.stm> | 26 | 5.1 |
| **Low level music**  [http://grooveshark.com/#/s/Fall+At+Your+Feet/3KIZB0?src=5](http://grooveshark.com/) | N/A | 6.0 |
| **Low level video** <http://news.bbc.co.uk/2/hi/programmes/click_online/8610962.stm> | N/A | 6.3 |

1. Evaluate the extent to which sustainability could be integrated into an upgrade of the computer system.

Total power draw for a 20 seat thin client system:

20 Y100 units use 66 watts of power (20 x 3.3 watts) during a typical excel training session along with 420 watts for the monitors (20 x 21 watts) that’s a total of 66+420=486 watts of power for the machines factor in 11 watts for a network switch and 24 watts for the server a typical 20 seat thin client would use around 521 watts of power.

(Show your calculations)

Total power draw for a 20 seat PC system:

20 Desktop PC use (20 x 24 watts) 480 watts of power during a typical excel training session along with another (20 x 21 watts) 420 watts of power for the screens giving the machine alone 900 watts of power usage for the training session. Note that’s if a network was not required if it was we would have to add an additional 11 watts for the switch and perhaps another 24 watts for a server making the exercise even more power costly at 935 watts.

Advise your recommendations:

My recommendation would be to use a thin client environment with software held on server & to other organizations & Institutions would be to research before jumping into any solution or even consider contacting a consultant if it is a large environment. Also that everyone & every environment requires different recourses, there is no all in one solution for anyone it will vary depending on your needs. In conclusion I recommend anyone to implement sustainability into their environment. There are so many simple things you can do that can make so much difference to reduce your overall global emissions.